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AUTHOR Winchell, Leonard
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ABSTRACT

The progress of elementary school students in Tacoma, Washington's Remediation Assistance Program (RAP) was examined and compared with the progress of similar non-RAP students. Pretest and posttest scores for RAP and non-RAP students in reading, mathematics and language were compared statistically, and no significant difference was found between the two groups. Students given remedial instruction did not appear to perform differently from similar students receiving regular classroom instruction when assessed with standardized, grade-level objective tests. (Author/APM)

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AN EXAMINATION OF STUDENT PROGRESS IN TACOMA'S REMEDIATION ASSISTANCE PROGRAM (RAP) COMPARED WITH PROGRESS OF SIMILAR NON-RAP STUDENTS

By

Leonard Winchell

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An Examination of Student Progress in Tacoma's Remediation Assistance Program (RAP) Compared with Progress of Similar Non-RAP Students

BACKGROUND

During the 1979-80 school year the State of Washington initiated the Remediation Assistance Program (RAP). Its purpose was to provide remedial help to students with academic deficiencies in reading, language arts, and/or mathematics. Further, these funds were intended for students not already receiving additional services through other state or federally-funded remedial programs. Guidelines for the program's first year were developed by the Office of the State Superintendent of Public Instruction. These guidelines limited program services to students in grades 2-6, and scoring below the 35th national percentile on an approved standardized test.

Funds were allocated to districts based on results from the statewide testing of grade 4 students during the prior 3 years. Tacoma's allocation of $382,477 was used at each of the District's 20 non-Title I elementary schools to fund a half-time Reading Resource/Basic Skills Teacher and a full-time assistant to work with identified students. An average of $1,500 per building was used for supplies and materials.

Although guidelines specified the use of a standardized test for pupil identification and evaluation, the Tacoma School District received permission to use its locally-developed Student Learning Objective (SLO) tests for these purposes. This leeway was based on the District's ability to link its SLO tests to the 1973 Comprehensive Tests of Basic Skills (CTBS), a standardized test widely used in Tacoma. The linking was accomplished through latent trait methodology (Rasch model) and allowed the SLO test results to be related to CTBS norms.

The end-of-year report submitted to the State was favorable toward the RAP program. Substantial normative growth was shown for most students in grades 2 and 3, and students in grades 4, 5, and 6 showed moderate improvement. This report is usually a program's final product. However, the research reported herein goes beyond the norm-referenced reporting and compares RAP students to similar groups of non-RAP students. The opportunity for research in remedial education has not usually existed in Tacoma because acceptable control groups have not been present. In this case, since resources limited the number of students that could be served to less than half the eligible population, a natural control group existed, and this research was conducted.

THE PROBLEM

Three research questions were investigated. These questions were:

1. Are there differences in the academic achievement of RAP students and eligible non-RAP students?

2. Are there differences in the academic achievement of RAP students in the lower, middle, or upper third based on pretest scores, and how do these groups compare with similar groups of non-RAP students?

3. Are there differences in the academic achievement of RAP students due to differences in the amount of program treatment?

Student test results in each academic area and for all grades were reported in Rasch units (Rits) from the District SLO testing. The scale of Rit scores is an equal-interval, standard score scale, where 200 represents typical performance at the beginning of grade 5. Although Rit scales look similar in all three subject areas, they are not identical. For all statistical analyses, Rit scores were used and a 90% confidence interval was used to test the significance of differences.

STUDENT SELECTION

Potential RAP students in grades 2-6 were identified at each of the 20 RAP schools based on their SLO scores from spring, 1979. All students scoring in the lowest 34% of Tacoma's scores for their grade in reading, language, and/or math were eligible.

There were 1887 eligible students identified. Of these, 790 (41.9%) were low in one area, 563 (29.8%) were low in two areas and 534 (28.3%) were low in all three academic areas.

Using staff resources as described earlier, and keeping within the State's guideline of working with 5 or fewer students at a time, it was clear that less than half of the eligible students would actually receive service. This provided an unusually fine opportunity for a research effort, complete with a control group identified on precisely the same criterion as was the treatment group.

Desirable research methodology includes the random selection of students into treatment and control groups. This was accomplished by randomly mixing all 1887 students eligible for program services. Once this random order was established, students were sequentially numbered by building in order to simplify recordkeeping. All project records were kept using these sequential numbers. A building that could serve 25 students was expected to serve the first 25 from their list. Exceptions were students no longer at the building, and students who were being served through the District handicapped program. There was no conflict with Title I, since RAP was offered only at buildings not a part of the District Title I program.

In order to maintain high teacher and principal support in following the selection design, one compromise was made. Each building was given the option of serving 5 students from their list that would not normally have been served due to random selection. Thirteen of the twenty schools did select a few students in this manner. These students were eliminated from both the treatment and control group due to their non-random selection. They received the same service as other students in the program, but their scores were excluded from the statistical analyses conducted in this study.

THE TREATMENT

The RAP program was staffed with a half-time teacher and full-time assistant at each of 20 buildings. (There were one or two exceptions at very small buildings, where time was divided.) Students served were pulled from their classrooms for 30 minute instructional periods. In general, students were scheduled 3 to 5 times per week in groups of 5 or fewer students. Teachers had control over their scheduling of students, given the usual building constraints. Students selected for treatment that were eligible in all three subjects were served in 2 of the 3 areas. This choice was left to the discretion of the teachers. Other students eligible in one or two subjects were served in all eligible areas.

A student served in two subjects was served approximately the same amount of time in each. This was accomplished in different ways. Some teachers rotated daily, whereas others used weekly or other scheduled rotations. The number of remedial sessions in each subject was recorded, so no assumptions of identically equal amounts of treatment time were necessary.

Another variable under teacher control was the number of sesions the student was pulled each week for the program. District guidelines specified no student would be pulled more than once a day. The minimum program service was intended to be 3 times per week. However, student absences and other schedule interruptions frequently caused students to receive service fewer than 3 times weekly.

Once a student had been selected for RAP, further, more detailed diagnostic testing was done by the RAP teacher. Using the results from formal and informal assessment, and other known student information, student objectives were specified by the teacher. Instruction on these objectives was either provided by the teacher or by the assistant, with supervision and guidance from the teacher. In cases where the assistants were seen as highly capable, they did most of the instructing while the teacher concentrated on diagnosis and prescription. Where the assistants were judged to be less capable, the teachers carried more of the instructional load. The teacher was also responsible for keeping accurate atendance records, which were later summarized and reported to the State, and were necessary for a portion of this research. Instructional methods and needed materials were determined by the building staff. Each building had approximately $1500 for supplies and materials.

STATISTICAL METHODOLOGY

All students in the RAP program and in the control group had Rit scores from the Districtwide SLO testing in May, 1979 (pretest) and May, 1980 (posttest). Separate scales of Rit values exist for reading, language arts, and mathematics. Due to differences between the scales and differential rates of student progress at various grades, analyses were done by grade and subject. Fifteen basic groups existed (5 grades x 3 subjects = 15 groups). All testing for statistical significance was done using a 90% confidence interval.

Following is a brief description of the statistical techniques used for each research question.

1. Are there differences in the academic achievement of RAP students and eligible non-RAP students?

A covariance analysis was used on posttest scores, using the pretest as the covariate. This approach served as a further validation of the randomness of student selection, and adjusted for possible non-random student attrition.

2. Are there differences in the academic achievement of RAP students in the lower, middle, or upper third based on pretest scores, and how do these groups compare with similar groups of non-RAP students?

Treatment and control pretest Rit scores were combined so that the groups could be divided into low, middle, and upper thirds. (See appendix table 19 for Rit score ranges used for each category.) The reader should be reminded that all students were from the District's lowest 34%, and that even the "high" category students are low when compared with the entire District population.

Difference scores (posttest less pretest) were calculated for all students. Then, an analysis of variance was used to test possible differences in growth among the treatment subgroups. (There are 45 subgroups - 15 groups x 3 categories.) Finally, t-tests were used comparing the growth of each treatment subgroup with its matching control subgroup.

3. Are there differences in the academic achievement of RAP students due to differences in the amount of program treatment?

Attendance records were kept on RAP students showing the number of sessions they were in the program. These records were based on actual attendance - not simply enrollment. At the end of the year low, middle, and high service categories were identified based on the number of treatment sessions. As nearly as possible, 1/3 of the students were coded into each subgroup. (There are 45 subgroups - 15 groups x 3 categories. See appendix table 19 for the number of sessions in each subgroup.)

Difference scores (posttest less pretest) were calculated for all students. Then, an analysis of variance was used to test whether the amount of program service was related to student growth. No comparable subgroups existed for the control group. However, t-tests were used to compare growth of the treatment subgroup receiving the most program service with growth of the entire control group.

RESULTS

Complete results from all statistical analyses are shown in appendix tables 4 to 18. Certain pertinent portions of these tables are repeated in the text below.

1. Are there differences in the academic achievement of RAP students and eligible non-RAP students?

Table 1 shows the mean Rit pre and posttest scores for the two groups where statistically significant differences were found. In grade 2 reading, the control group achieved significantly higher posttest results than the RAP group, whereas the RAP group was higher at grade 3 in math. No statistically significant differences were found on any of the other 13 comparisons. Analyses of scores from all treatment and control students lead to the conclusion that, on the average, the performance of RAP and non-RAP students was similar.

TABLE 1

Rit Score Means of RAP and Non-RAP Groups

and F-Values on Posttest Differences

	Test	RAP Mean	Non-RAP Mean	ANCOVA F
Grade 2	Pretest	162.70	161.59	
Reading	Posttest	175.57	180.42	6.38**
Grade 3	Pretest	179.18	180.38	
Math	Posttest	198.34	195.26	4.58**

**$p < .05$

2. Are there differences in the academic achievement of RAP students in the lower, middle, or upper third based on pretest scores, and how do these groups compare with similar groups of non-RAP students?

Table 2 shows the five grade/subject groups where the amount of student growth in RAP appeared to be significantly related to the level of the student pretest scores.

TABLE 2

Rit Score Mean Changes for RAP and Non-RAP Groups
by Pretest Category, Showing F and t-Values

	Pretest Category	RAP Mean Change	ANOVA F	Non-RAP Mean Change	t-Value by Category
Grade 2 Math	Low	21.39	2.66*	21.23	0.03 N.S.
	Middle	11.31		12.40	-0.27 N.S.
	High	13.77		8.78	1.20 N.S.
Grade 3 Math	Low	24.37	3.01*	15.94	2.56**
	Middle	17.06		15.03	0.70 N.S.
	High	14.80		13.74	0.33 N.S.
Grade 5 Language	Low	13.29	3.80**	10.85	1.15 N.S.
	Middle	9.15		9.96	-0.40 N.S.
	High	7.50		4.39	1.60 N.S.
Grade 6 Reading	Low	9.47	6.76***	7.74	0.98 N.S.
	Middle	2.81		6.48	-1.44 N.S.
	High	2.78		5.37	-1.10 N.S.
Grade 6 Language	Low	8.90	2.96*	12.06	-1.24 N.S.
	Middle	6.06		6.33	-0.14 N.S.
	High	3.43		3.83	-0.19 N.S.

*p < .10 **p < .05 ***p < .01 N.S. = Not Significant

In all five instances, students in the low category showed the most improvement. This finding was soon tempered by examination of growth in the comparable control groups. This examination revealed exactly the same pattern in the control groups--students in the lowest pretest category showed more growth than students in the middle and high categories. Follow-up t-tests comparing the mean changes of treatment and control groups revealed only one comparison, grade 3 math, to be significantly different. In that case, RAP students in the low pretest category had higher gains than did comparable non-RAP students. It appears that statistical regression explains most of the differences where students in the low RAP category appeared to gain more than students in the middle and high categories.

The complete series of 45 t-tests (see appendix tables 4 to 18) revealed only 5 comparisons where statistically significant differences were found. Examination of the mean gain scores from all 45 comparisons, even though most differences were too small to be of any importance, showed 22 favoring RAP students and 23 favoring the control students. These t-test results suggest that no real differences exist between RAP and non-RAP students, regardless of whether the pretest scores were at the low, middle, or high end of the program-eligible distribution.

3. Are there differences in the academic achievement of RAP students due to differences in the amount of program treatment?

Table 3 shows the three grade/subject groups where the amount of student growth in RAP appeared to be significantly related to the amount of service provided to RAP students.

TABLE 3

Rit Score Mean Changes for RAP Students

by Amount of Service, Showing F and t-Values

	Amount of RAP Service	RAP Mean Change	ANOVA F	Non-RAP Mean Change	t-Value
Grade 2 Reading	Low	6.50	4.74**	Entire Group	
	Middle	15.71			
	High	16.56		18.83	-0.71 N.S.
Grade 2 Language	Low	12.30	3.92**	Entire Group	
	Middle	8.70			
	High	19.20		13.48	2.04 **
Grade 6 Reading	Low	0.29	8.25***	Entire Group	
	Middle	8.25			
	High	5.85		6.49	-0.31 N.S.

**p < .05 ***p < .01 N.S. = Not Significant

In the case of second grade reading, students in the low service category showed substantially less gains than those in the middle and high service categories. In grade 2 language, students in the high service category gained most, while the middle group did least well. Results from grade 6 reading revealed the middle category students having the greatest gains, while the low category students showed essentially no change at all.

There were no comparable control groups for each treatment category, since control students received no RAP service. However, the gain score of each total control group was tested against the gain score of RAP students in the high amount of service category. These t-tests revealed significant differences favoring RAP students in grade 2 language and grade 3 math, while favoring the control students in grade 6 language. (See appendix tables 5, 9, and 17.)

These examinations of progress of RAP students according to the amount of program service determined that the amount of progress made by RAP students was not consistently related to the amount of time students spent in the program.

SUMMARY OF RESULTS

After analyzing data from Tacoma's 1979-80 RAP program, it was found that the achievement of students in the program was about the same as achievement of similar students in the same buildings not in the program. Significant posttest score differences were found only in grade 2 reading (favoring the control group) and in grade 3 math (favoring the RAP group).

When RAP student gain scores (posttest less pretest) were analyzed by pretest category (low, middle, or high), the low group significantly outgained the other groups in 5 of 15 comparisons. However, similar performance by the control students suggested these differences were probably due to statistical regression, and not real program effects.

When RAP student gain scores were analyzed by category based on the amount of time in the RAP program (low, middle, or high), it was found that the amount of student progress was not consistently related to the amount of time students spent in the program.

LIMITATIONS

This study was done under conditions that exist in the Tacoma Public Schools. The nature of the treatment varied somewhat between buildings. Classroom teachers administered the SLO tests in their accustomed manner, with no additional controls. The SLO tests themselves, since they were grade level tests, may not have been as sensitive as would be desirable to measure progress of students who were performing considerably below grade level. (This is a limiting condition for both RAP and non-RAP groups.) Finally, there may have been a few cases where teachers sacrificed the purity of the research design in order to give some needed help to non-RAP students.

These limitations are a reminder that school-based research should always be interpreted with caution, since variables beyond the control of the researcher are present. Nevertheless, results from this study raise important questions about how to provide remedial help to students.

CONCLUSIONS AND RECOMMENDATIONS

A total of 75 different statistical comparisons were made between treatment and control groups by grade/subject/category. Of these, only 10 differences were found to be statistically significant. Seven of the 10 favored the treatment group, and three favored the control group. Since a 90% confidence interval was used to determine significance, of 75 comparisons, one would expect 7 or 8 differences to show up by chance alone. It must be concluded that Tacoma's RAP students pulled out of class into small groups for 10 to 60 hours of objective-based remedial instruction in reading, language arts, or mathematics do not appear to perform differently from similar students receiving regular classroom instruction, when assessed with standardized, grade-level objective tests.

Remedial instruction in Tacoma has typically been offered to low-achieving students by removing them from their regular classrooms for additional instruction. The guidelines for RAP required this procedure. While guidelines for remedial programs like RAP and Title I state that program services are "in addition to" the regular instruction, unless extra time is added to the school day, this is not possible. When students are pulled out, clearly some part of their usual instruction is interrupted. The benefits of this approach have not been confirmed by this study. While there is no denying the academic need for many students to receive remedial help, data from this study suggest that alternative methods for delivering the necessary instruction should be considered.

APPENDIX

TABLE 4

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 2 Reading

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	53	162.70	4.65		83	161.59	6.03		
Posttest	53	175.57	11.87		83	180.42	12.64		6.38**
Pre/Post Change	53	12.87	11.59		83	18.83	12.85		
Pre/Post Change by pretest category									
Low	20	14.60	11.85	1.20 N.S.	34	20.09	15.49	-1.36 N.S.	
Middle	15	14.67	11.40		22	18.82	9.90	-1.18 N.S.	
High	18	9.44	11.30		27	17.25	11.51	-2.25 **	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	18	6.50	12.35	4.74**	Entire Control Group				
Middle	17	15.71	10.59						
High	18	16.56	9.33		83	18.83	12.85	-0.71 N.S.	

**p <.05 N.S. = Not Significant

TABLE 5

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 2 Language

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	35	173.74	3.74		85	172.31	5.87		
Posttest	35	188.46	10.07		85	185.79	8.45		1.11 N.S.
Pre/Post Change	35	14.71	9.52		85	13.48	8.14		
Pre/Post Change by pretest category									
Low	7	18.42	9.80	1.32 N.S.	24	15.38	10.79	0.67 N.S.	
Middle	13	11.61	9.91		29	13.90	7.21	-0.84 N.S.	
High	15	15.67	8.83		32	11.69	6.33	1.77 *	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	10	12.30	7.32						
Middle	10	8.70	7.44	3.92**	Entire Control Group				
High	10	19.20	10.44		85	13.48	8.14	2.04 **	

*p <.10 **p <.05 N.S. = Not Significant

TABLE 6

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 2 Math

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	44	167.57	8.22		85	169.91	7.82		
Posttest	44	183.73	12.47		85	183.19	12.37		0.18 N.S.
Pre/Post Change	44	16.16	13.29		85	13.28	14.22		
Pre/Post Change by pretest category									
Low	18	21.39	12.14		22	21.23	17.06	0.03 N.S.	
Middle	13	11.31	15.15	2.66 *	30	12.40	10.47	-0.27 N.S.	
High	13	13.77	11.04	3.04 *	33	8.78	13.27	1.20 N.S.	
Pre/Post Change by amount of service	Covaried by amount of service							High Treatment vs Entire Control	
Low	15	12.53	16.11						
Middle	14	17.14	10.47	0.90 N.S.	Entire Control Group				
High	15	18.87	12.59		85	13.28	14.22	1.42 N.S.	

*p <.10 N.S. = Not Significant

TABLE 7

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 3 Reading

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	52	174.19	6.66		90	173.96	6.79		
Posttest	52	186.63	11.70		90	184.98	10.68		0.72 N.S.
Pre/Post Change	52	12.44	10.43		90	11.02	10.30		
Pre/Post Change by pretest category									
Low	19	14.00	9.60	0.58 N.S.	28	13.71	10.69	0.09 N.S.	
Middle	16	12.88	10.78		30	9.97	10.23	0.90 N.S.	
High	17	10.29	11.24		32	9.66	9.87	0.21 N.S.	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	17	10.88	10.92	0.30 N.S.					
Middle	18	12.83	10.72		Entire Control Group				
High	17	13.59	10.08		90	11.02	10.30	0.95 N.S.	

N.S. = Not Significant

TABLE 8

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 3 Language

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	18	179.00	4.35		73	179.48	5.67		
Posttest	18	194.17	9.39		73	190.45	11.11		1.80 N.S.
Pre/Post Change	18	15.17	10.27		73	10.97	11.86		
Pre/Post Change by pretest category									
Low	8	17.25	14.26	0.99 N.S.	21	14.38	14.06	0.49 N.S.	
Middle	7	16.00	4.97		26	12.42	11.19	0.82 N.S.	
High	3	7.67	2.52		26	6.77	9.58	0.16 N.S.	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	7	15.43	13.66	0.70 N.S.	Entire Control Group				
Middle	5	12.00	10.10						
High	6	17.50	6.02		73	10.97	11.86	1.33 N.S.	

N.S. = Not Significant

TABLE 9

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 3 Math

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	50	179.18	7.68		102	180.38	6.87		
Posttest	50	198.34	12.17		102	195.26	10.67		4.58 **
Pre/Post Change	50	19.16	12.52		102	14.88	9.57		
Pre/Post Change by pretest category									
Low	19	24.37	13.31		33	15.94	10.23	2.56 **	
Middle	16	17.06	10.04	3.01 *	34	15.03	9.37	0.70 N.S.	
High	15	14.80	12.28		35	13.74	9.28	0.33 N.S.	
				4.16 **					
Pre/Post Change by amount of service	Covaried by amount of service							High Treatment vs Entire Control	
Low	17	17.06	10.27						
Middle	17	17.12	12.86	1.48 N.S.	Entire Control Group				
High	16	23.56	13.89		102	14.88	9.57	3.15 ***	

*p <.10 **p < .05 ***p < .01 N.S. = Not Significant

TABLE 10

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 4 Reading

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	52	182.25	7.56		78	182.82	6.79		
Posttest	52	190.13	9.49		78	191.67	9.61		0.60 N.S.
Pre/Post Change	52	7.88	8.92		78	8.85	8.73		
Pre/Post Change by pretest category									
Low	17	10.88	7.48	2.20 N.S.	25	11.52	8.02	-0.26 N.S.	
Middle	21	7.86	7.58		27	8.15	8.47	-0.12 N.S.	
High	14	4.29	11.38		26	7.00	9.34	-0.81 N.S.	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	16	8.31	9.31	2.27 N.S.					
Middle	19	4.79	9.27		Entire Control Group				
High	17	10.94	7.37		78	8.85	8.73	0.92 N.S.	

N.S. = Not Significant

TABLE 11

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 4 Language

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	44	187.64	4.75		69	186.62	6.09		
Posttest	44	196.14	7.21		69	195.06	8.17		0.14 N.S.
Pre/Post Change	44	8.50	6.41		69	8.43	8.29		
Pre/Post Change by pretest category									
Low	11	10.54	6.64	1.93 N.S.	23	12.00	6.52	-0.61 N.S.	
Middle	15	6.00	7.31		22	8.23	8.95	-0.80 N.S.	
High	18	9.33	5.01		24	5.21	8.11	1.90 *	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	15	8.53	7.03	0.04 N.S.					
Middle	15	8.13	6.09		Entire Control Group				
High	14	8.86	6.51		69	8.43	8.29	0.18 N.S.	

*p <.10 N.S. = Not Significant

TABLE 12

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 4 Math

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	53	187.32	5.76		84	187.99	5.63		
Posttest	53	200.55	6.84		84	201.64	8.35		0.32 N.S.
Pre/Post Change	53	13.23	6.68		84	13.65	7.87		
Pre/Post Change by pretest category									
Low	21	15.33	8.34	1.85 N.S.	27	16.37	8.16	-0.43 N.S.	
Middle	20	12.15	4.75		26	12.62	6.81	-0.27 N.S.	
High	12	11.33	5.57		31	12.16	8.07	-0.33 N.S.	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	19	12.79	8.00	0.07 N.S.	Entire Control Group				
Middle	17	13.59	6.70						
High	17	13.35	5.27		84	13.65	7.87	-0.15 N.S.	

N.S. = Not Significant

TABLE 13

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 5 Reading

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	88	191.32	5.64		96	190.24	6.23		
Posttest	88	200.97	10.58		96	199.35	10.68		0.31 N.S.
Pre/Post Change	88	9.65	9.89		96	9.11	9.66		
Pre/Post Change by pretest category									
Low	27	12.44	11.45	1.58 N.S.	36	12.28	10.62	0.06 N.S.	
Middle	28	8.25	9.18		30	9.37	9.27	-0.46 N.S.	
High	33	8.55	8.89		30	5.07	7.34	1.68 *	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	30	8.43	8.90	0.42 N.S.					
Middle	28	9.71	10.18		Entire Control Group				
High	29	10.82	10.91		96	9.11	9.66	0.81 N.S.	

*p <.10 N.S. = Not Significant

TABLE 14

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 5 Language

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	54	192.48	5.39		85	191.13	5.94		
Posttest	54	202.20	6.47		85	199.61	8.14		2.32 N.S.
Pre/Post Change	54	9.72	7.03		85	8.48	7.32		
Pre/Post Change by pretest category									
Low	17	13.29	6.56		34	10.85	7.44	1.15 N.S.	
Middle	13	9.15	4.79	3.80 **	23	9.96	6.20	-0.40 N.S.	
High	24	7.50	7.57		28	4.39	6.47	1.60 N.S.	
				3.66 **					
Pre/Post Change by amount of service	Covaried by amount of service							High Treatment vs Entire Control	
Low	18	9.94	7.54						
Middle	18	9.00	7.33	0.08 N.S.	Entire Control Group				
High	17	9.65	6.24		85	8.48	7.32	0.61 N.S.	

**p <.05 N.S. = Not Significant

TABLE 15

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 5 Math

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	50	198.32	4.76		85	197.55	4.48		
Posttest	50	207.78	8.75		85	208.69	7.10		1.22 N.S.
Pre/Post Change	50	9.46	8.36		85	11.14	6.65		
Pre/Post Change by pretest category									
Low	15	11.27	6.72		32	12.16	6.63	-0.43 N.S.	
Middle	17	8.76	7.57	0.49 N.S.	33	10.09	7.25	-0.60 N.S.	
High	18	8.61	10.30		20	11.25	5.61	-0.99 N.S.	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	17	8.29	6.62						
Middle	17	8.76	11.19	0.66 N.S.	Entire Control Group				
High	16	11.44	6.44		85	11.14	6.65	0.16 N.S.	

N.S. = Not Significant

TABLE 16

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 6 Reading

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	62	197.68	7.17		88	196.11	8.90		
Posttest	62	202.52	7.29		88	202.60	11.33		0.91 N.S.
Pre/Post Change	62	4.84	7.20		88	6.49	8.62		
Pre/Post Change by pretest category									
Low	19	9.47	5.49	6.76 ***	27	7.74	6.21	0.98 N.S.	
Middle	16	2.81	7.92		31	6.48	8.46	-1.44 N.S.	
High	27	2.78	6.46		30	5.37	10.57	-1.10 N.S.	
				7.73 ***					
Pre/Post Change by amount of service	Covaried by amount of service							High Treatment vs Entire Control	
Low	21	0.29	5.20	8.25 ***					
Middle	20	8.25	7.36		Entire Control Group				
High	20	5.85	6.68		88	6.49	8.62	-0.31 N.S.	

***p < .01 N.S. = Not Significant

TABLE 17

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 6 Language

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	48	197.58	4.46		87	194.44	7.58		
Posttest	48	203.08	5.88		87	202.34	7.20		0.19 N.S.
Pre/Post Change	48	5.50	6.21		87	7.91	8.01		
Pre/Post Change by pretest category									
Low	10	8.90	5.15		34	12.06	7.50	-1.24 N.S.	
Middle	17	6.06	5.44	2.96 *	30	6.33	7.24	-0.14 N.S.	
High	21	3.43	6.68		23	3.83	7.07	-0.19 N.S.	
				2.71 *					
Pre/Post Change by amount of service	Covaried by amount of service							High Treatment vs Entire Control	
Low	18	7.33	6.73						
Middle	13	5.77	3.56	2.10 N.S.	Entire Control Group				
High	15	2.93	7.16		87	7.91	8.01	-2.25 **	

*p <.10 **p < .05 N.S. = Not Significant

TABLE 18

Rit Pretest, Posttest, and Change Scores for RAP and Non-RAP Students

Showing Difference Analyses for Grade 6 Math

	RAP Group (Treatment)				Non-RAP Group (Control)				ANCOVA
	N	Mean	S.D.	ANOVA F	N	Mean	S.D.	t-value	F
Pretest	38	204.95	3.44		94	202.54	5.08		
Posttest	38	213.26	5.45		94	212.28	7.23		0.14 N.S.
Pre/Post Change	38	8.32	4.59		94	9.73	7.04		
Pre/Post Change by pretest category									
Low	8	8.00	4.41	0.03 N.S.	40	12.23	6.30	-1.80 N.S.	
Middle	12	8.50	4.38		26	7.50	6.10	0.51 N.S.	
High	18	8.33	5.03		28	8.25	7.92	0.04 N.S.	
Pre/Post Change by amount of service								High Treatment vs Entire Control	
Low	14	8.07	5.06	0.11 N.S.	Entire Control Group				
Middle	12	8.08	4.87						
High	12	8.83	4.04		94	9.73	7.04	-0.43 N.S.	

N.S. = Not Significant

TABLE 19

Ranges of Pretest Rit Scores and Number of

Instructional Sessions Used for Category Groupings

	READING		LANGUAGE		MATH	
	Pretest Rits	Number of Sessions	Pretest Rits	Number of Sessions	Pretest Rits	Number of Sessions
Grade 2						
Low	136-161	20-40	144-170	18-46	123-166	23-40
Middle	162-165	41-58	171-174	47-60	167-173	41-59
High	166-171	59-146	175-180	61-140	174-177	60-118
Grade 3						
Low	148-171	20-38	162-178	28-40	158-179	23-39
Middle	172-178	39-56	179-182	41-49	180-184	40-67
High	179-194	57-114	183-185	50-78	185-188	68-108
Grade 4						
Low	157-180	21-41	162-185	25-43	164-186	20-48
Middle	181-187	42-58	186-189	44-59	187-190	49-59
High	188-191	59-115	190-201	60-117	191-202	60-112
Grade 5						
Low	171-188	21-41	173-190	22-35	184-197	21-40
Middle	189-194	42-57	191-195	36-51	198-200	41-61
High	195-199	58-118	196-200	52-83	201-203	62-110
Grade 6						
Low	172-194	20-34	170-194	18-32	185-202	28-42
Middle	195-201	35-45	195-200	33-46	203-205	43-53
High	202-206	46-102	201-206	47-94	206-209	60-96